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Version: Version of Record

Link(s) to article on publisher's website:
<http://dx.doi.org/doi:10.21954/ou.ro.0000c63e>

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Learning Identity Framework:
Learning Identity through Self-Awareness

Dissertation for
Masters of Research (MRes) degree

The Open University
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Re-Submitted: 11 May 2017

Abstract

The goal of this dissertation is to establish the views and support of experts in the field of learning technologies and of potential users on the concept of using a Learning Identity Framework to positively influence learning identity development. As a secondary objective, the research attempts to define and describe the components of the learning informatics framework.

Conceptually the Learning Identity Framework will be a technology-supported platform (upon which other technologies and applications can be utilized) that will put in the hands of lifelong learners a process to record daily events, allow for critical self-examination of what they needed to know, what worked, what didn't work, and to make that personal data usable and actionable at an individual level.

The theoretical premise for the Learning Identity Framework is based on a sociocultural and interpretivist context, with a level of advocacy brought through the use of self-narration as one of the more common and effective means of self-representing an Individuals identity as a means of self-reflection. Self-narration in this dissertation is represented as an *autobiographical story* created by memories of the past, edited by present experiences and used to foreshadow a learner's beliefs in their ability to learn in the future.

The analysis of existing learning frameworks, interviews, and workshop data, support findings that proposed a framework based on core personal informatics attributes. The model developed and described supports a habitual method to record, question and to recall what was heard, read or written for reflection, with the intention to affect changes to learner identity in a positive manner.

The concepts, components and structure of the Learning Informatics Framework proposed in this research lay a strong foundation for the deployment of

the framework as means for future research to better understand the role of identity in lifelong learning and, more importantly, to empower learners at a personal level.

Table of Contents

Abstract	2
CHAPTER 1: Aims and Objectives	6
Introduction	6
Aims	7
Objectives.....	8
Conclusion.....	9
Chapter 2 Literature review	10
Introduction	10
Learning Identity.....	10
Actionable Learning Identity	12
Lifelong Learning.....	13
Existing Learning Frameworks	15
Personal Informatics	18
Chapter 3 Methods of Data Collection	24
Introduction	24
Theoretical Foundation	25
Methodologies and Methods	26
Research Design and Methods.....	27
Existing Framework Comparison	28
Interviews	29
Participatory Workshop	31
Ethics.....	32
Chapter 4 Data Collection and Analysis	33
Introduction	33
Researcher Predisposition	34
Existing Framework Comparisons	35
Interview Data Collection	36
Participatory Workshop	38
Analysis	39
Framework Comparison Analysis.....	39
Interview Thematic Analysis.....	43
Participatory Workshop	47
Chapter 5: Conclusions	49
Limitations.....	53
Future Research.....	55
Reference List.....	56
Appendix A: Interview Question Themes	62
Appendix B: Workshop exercises Eisenhower Chart	64

List of Figures.

Figure 1. Theories and Methodologies Hierarchy (adapted from Twining et al., 2017, pp A2)	27
Figure 2. Data Gathering Flow Chart	28
Figure 3. Learning Informatics Framework Components	52

List of Tables.

Table 1. PI Core Attributes and Criteria (Ohlin et al., pp 94)	19
Table 2. Workshop Decision Chart Example	38
Table 3. Criteria Comparison Example	40
Table 4. Learning Framework Comparison Table	41
Table 5. Learning Framework Focus Comparison Chart	42
Table 6. Interviewee Response to Coding Themes	44
Table 7. Interviewee Emergent Themes	45
Table 8. Participant Responses in Percentage	48

List of Abbreviations.

ALS	Autonomous Learning Strategy.
BERA	British Educational Research Association.
HREC	Human Research Ethics Committee.
IET	Institute of Educational Technology.
LIF	Learning Informatics Framework.
PI	Personal Informatics.
PTSD	Post Traumatic Stress Syndrome.
QS	Quantified Self.
SRL	Self-Regulated Learning.
TESS	Teacher Education through School-Based Support.

CHAPTER 1: Aims and Objectives

Introduction

The broad intention of this research is to begin a discussion about the impact learner identity has on an individual's ability to pursue lifelong learning opportunities. Ultimately this dissertation has the intent to operationalize the concept of learner identity self-help and provide a platform for future research, by describing the components of a platform for the learner to self-monitor, record the self-narrative of events and ultimately critically reflect upon those events

The Learning Identity Framework (LIF) at the most basic level supports the learner as an individual by providing a platform to record daily events, allow for critical examination of what they need to know, what worked, and what didn't work. This process of reflection on the personal or structural barriers to success offers the learner an opportunity to understand and create strategies to overcome barriers and become self-aware enough to constructively seek external support when needed.

This research is underpinned by a belief that learning is an intimate and uniquely personal activity that is practiced in the public sphere. The tensions that are created between the reciprocal nature of personal and public learning do not fit nicely within the labels of educational theories. Consequentially a learner's identity cannot be contained within the institutional created boundaries of informal and formal learning, and must be acknowledged as a major influencer in all aspects of an individual's life.

Similarly, this research takes the position that the metaphor of an autobiographic story best represents a learner's identity, and is created by memories

of the past, edited by present experiences, to describe the learner's future identity, shaping beliefs in their ability and resilience of the learner.

There is extensive literature in the field of "identity", but there is limited research into formation and maintenance of identity in both formal and lifelong learning domains (Knights and Clark, 2014). The literature primarily looks at learner identity in two ways. The first is from a meta-perspective that group's people under broad heading of the disempowered based on race, religion, socioeconomic, past learning experience or cultural restrictions for educational opportunities (Belanger, 2016; Faure, 1972). The second approach is to define learner identity development through process-regulation within a formal educational context. This approach seems to off-load some of the responsibility for managing the development of identity to educational or institutional systems (Belanger, 2016).

Contemporary solutions are also stratified into two structures: strategic and political based, instituted through governance, funding and policy, as a top-down approach, or institutionally based, relying on analytic research, curriculum design and regulation. Both approaches stress the importance of individual in the process but offer no clear suggestions for how a learner should take ownership of the identity development or be an active participant in their self-development. This lack of a clear conception of how an individual can help themselves and take ownership of their learning identity to self-develop is where this research takes inspiration.

Aims

The aim of this study is to explore and identify a technologically-mediated framework that supports self-awareness through the collection, reflection and analysing of personal data. The objective of this dissertation is to establish if learning technology experts support the concept of a learning informatics framework to

support user identity development and to describe the constituent components and foundational technological systems that would comprise a Learning Informatics Framework.

The Learning Informatics Framework is intended to offer a new approach to developing self-awareness as part of personal learning identity, maximising the chances to successfully learn as a lifelong learner. To support this research goal, the following primary research questions will be addressed:

- 1) Based on a comparison of existing learning frameworks, what are the foundational technological systems and components that would comprise a Learning Informatics Framework?
- 2) In what ways do the views of learning technology experts and potential users support the development of a Learning Informatics Framework?

Objectives

To support the research aim it is necessary to establish a series of steps, boundaries and objectives that will guide the dissertation. One of the initial steps is to give context to the research by defining the scope of the literature that will be reviewed. It is also important to acknowledge that the concept of using a technology-mediated framework to support learning is not new, but to use a technology mediated framework to support learner identity-building through self-narration is less common, and possibly unique to this dissertation.

This uniqueness of the aim necessitated that the literature selection would be broader and multidisciplinary in scope than to fill in the gaps that the questions posed in the previous paragraph highlighted. The literature review (Chapter 2) encompasses literature from similar technology-mediated frameworks used in education, personal awareness, and development of Quantified Self (QS)

technology. The literature review also needed to encompass the concepts of learner identity, positive technology, lifelong learning, and self-narration as a means of personal enrichment, to bridge the philosophical gaps that are associated with identity and self.

Finally, the literature review also provides a defensible foundation for situating the Learning Identity Framework from an ontological and epistemological position to guide the subsequent chapters dealing with methodology, methods and findings. The literature was the primary source data to be discussed and adapted through the progressive stages of research into a conceptual technology mediated framework.

The chapters following the literature review discuss research method selection, describing the theoretical foundations, research steps, and sequencing. The findings seek to bring clarity to the research data as well as a level of validity to the selection of framework components and proposed functionality. The finding chapter will provide a summary of the research, its limitations, and suggestions for future research.

Conclusion

Learning identity as seen in this dissertation is an intimate and personal construct, but many of the external influencers that affect identity are not. Belanger, (2016), identified race, gender, economic status, self-blame for academic failures and traumatic educational experiences as some of the more common causes. Alexander-Passe, (2015) echoed that the effects of traumatic learning experiences in his research that looked at forms of Post-Traumatic Stress Disorder (PTSD) in Dyslexic learners when attempting to access learning opportunities as adults. Many of the factors (race, gender, disability, social exclusion, religion) are institutional,

cultural or global in nature and look for resolution at those levels.

However, every learner who chooses to understand themselves and enrich their lives through developing stronger and resilient learning identities should be offered the tools to do so. It is the goals of this research to start that process.

Chapter 2 Literature review

Introduction

This literature review aims to establish a theoretical position that supports the uniqueness of the Learning Informatics Framework, to frame the research questions and provide focus for the research. This chapter will first explore learning identity from a theoretical position before moving on to how learning identity can be made actionable, and then looking at identity in lifelong learning. The literature review will then examine existing learning frameworks and close by making a case for personal informatics as a suitable platform to develop the Learning Informatics Framework.

Learning Identity

Examining identity as a conceptual and socially constructed phenomenon has produced research that spans many domains and disciplines e.g. (Hawg, 2010; Fivush et al., 2010; Knights and Clarke, 2014; Sfard and Prusal, 2008; Belanger, 2016).

In the search for a working definition for “identity”, it became apparent that for many “identity” is an umbrella term that often has multiple and diverse meanings. The definition in many cases is dependent on the researcher intention, discipline, domain and research focus, and is often used to described character, grit, aptitude, efficacy, attitude, concept of self, and self-beliefs. Falsafi, (2010) points to the confusion between identity and self, and how identity is often used in interchangeably with personality, self and ego or together in the form of self-identity.

Hawg, (2010) saw individuals as having multiple identities operating as a sub-system of the concept of an individual's 'self-concept', informing the individual's belief about themselves. Knights and Clarke (2014) saw identity as the "ongoing questions of 'who I am' and 'how I should act' within the multiple, dynamic and potential selves we accept that an individual has multiple identities that inform the learner about who they are and how they should act as part of the larger concept of self, we can attempt to situate learning identity in a theoretical paradigm. Learning identity is formed and developed as a result of tensions between who the learner believes they are, social and cultural influences and self-imagined representation of who they would like to be in the future (Dweck and Leggett, 1998). This representation is consistent with Penuels and Wertch's (1995) sociocultural approach to identity formation. Penuels and Wertch (1995) suggest identity is a "*form of action*" that is culturally and historically situated, "*concerned with persuading others (and oneself) about who one is and what one values to meet different purposes: express or create solidarity, opposition, differences, similarity, love, friendship, and so on*".

Learning identity was described earlier in Chapter one as an intimate and personal self-examination that is socioculturally situated. Fivush et al., (2011) extends this self-examination to include "*autobiographical narratives that help define memory, self and identity*". Fivush et al., (2011) see the autobiographic narration as socioculturally situated that "*serve to create a sense of individual consistency and coherence across time*" and as "*life narrative that helps define individual identity*".

Synthesising these positions, this dissertation defines learning identity as the 'active and actionable representation of one's self-beliefs, which are defined through autobiographical self-narration to construct an internal representation of themselves

as a learner”. Learning identity in this definition is not thought of as an individualistically cognitive activity, separate from the external world, nor is it believed that identity is socially constructed beyond the control of the individual but as a reciprocal and interdependent relationship. As Coll and Falsafi (2010) commented *“It takes at least two to construct an identity, but no matter how social and relational its construction and use [identity] always requires the subjective experience of an individual”*.

Actionable Learning Identity

For learning identity to be actionable implies that individuals have some control over the formation of their identity. If we shape how we see ourselves and how others see us through an autobiographical narration of who we are a learner, then the question becomes, can the telling of these life-stories be influenced by the individual? If their new experience matches the representation of past learning experiences then their learning identity is re-enforced, if the experience exceeds or does not meet their expectations, then learning identity may enter a state of (re)construction. As Falsafi, (2010) observed; each time a learner decides whether to begin a new learning activity or not, their past experiences are used to gauge their potential for success.

The opportunity for the Learning Informatics Framework lies in providing the learner with the means technologies or tools to support this (re)construction.

The interpretation of (re) construction as a “form of action” (Penuels and Wertch, 1995) is sympathetic to Foucault’s description of ‘technologies of self’ as a means for individuals to effect by their own means or with the help of others to transform themselves to achieve a certain state of happiness, purity, wisdom, and/or perfection (Falsafi, 2010; Martin et al., 1988).

Adopting this perspective, the Learning Informatics Framework can be considered through a Foucauldian lens as a contemporary instantiation of the “*technologies of self*” to provide support to the process of constructing meaning from life-stories (autobiography), acting as a framework to record and recall what was heard, read or written with the desire to effect changes to learner identity in a positive manner.

The previous sections are not intended to be an in-depth analysis of formation of identity, as that is certainly a research project on to itself. The goal was to highlight the potential of using the Learning Identity Framework to influence the construction and reconstruction of learning identities as means to have a positive effect on learners. The remaining portion of the discussion of learner identity will focus on the impact it can have in the notion of lifelong learning. As Falsi (2010) and Belanger, (2016) contend, the importance of a well-developed learning identity is critical to lifelong learners.

Lifelong Learning

Discussion about learner identity within the domain of lifelong learning has recently increased focus on how the concept of self and identity impact lifelong learning and adult-education (Belanger, 2016; Zhao and Biesta, 2012; Gee, 2001; Belcadhi, 2016).

Recent literature has emphasised the need for policy and governance to promote lifelong learning as a *skill* to adapt to changing socioeconomic conditions and the changing face of formal education (Faure et al., 1972; Benavot et al., 2016; Belanger, 2016; Zhao and Biesta, 2012). Much the literature stressed the importance of lifelong learning as a method to provide an adaptable work force to meet the changing global work environment and to improve many the third world countries’

economic and social situations (Benavot et al., 2016; Belanger, 2016; Faure et al., 1972). Many studies recognised learner identity as a critical component to lifelong learning, adult education and the fulfilment of an individual as a person (Faure et al., 1972; Belanger, 2016; Hwang, 2010; Gee, 2016).

One of the common themes found in the reports was the need to rethink education, and a growing re-emphasis on the importance of lifelong learning and learner identity as method to stay relevant in the future job market and achieve personal fulfilment (Belanger, 2016).

The Learning Identity Framework as a means to develop the skills of lifelong learning brings with it a level of advocacy as it provides a technology-mediated platform to try and help an individual discover meaning in their everyday activities, enact social change and gain social mobility (Faure, 1972). The search for learning identity meaning enables an individual to critically evaluate what is happening around them and take ownership of their actions, maximizing their own potential as citizens as well as becoming critical actors in society (Faure, 1972).

In summary, the positioning of learning identity as sociocultural in formation as part of the broader concept of identity, constructed through autobiographical narratives, provides a theoretical foundation to evaluate and synthesize the literature that supports this research. The literature stresses the importance of learning identity as critical factor affecting lifelong learning as a skill to be actioned. To maintain clarity, this dissertation will treat the term “learning identity” as inclusive, encompassing the concepts of self-efficacy, attitudes, ego, and aptitudes.

Existing Learning Frameworks

This section reviews the learning frameworks of self-regulated learning (SRL) and autonomous learning strategies (ALS), examining the theoretical foundations and approaches to learning.

SRL has been actively researched for three decades and has a rich research background. Traditionally SRL is a cognitive and motivational process that has a minimum three stages/phases of operation: a planning stage, an execution phase, and a reflection stage. Boekaerts (1996) quotes Schunk and Zimmerman (1994) as defining SRL as “the process whereby students activate and sustain cognitions, behaviours, and affects, which are systematically orientated towards attainment if their goals”. Pintrich (2004) breaks down the SRL model into four general assumptions. The first assumption is that the learner is an active participant constructing their own meanings, goals and strategies. The second assumption relates to the learner’s ability to regulate their cognition, motivation, behaviours and to some extent their learning environment. The third assumption is that the learner has identified some goal or standard that they will use for comparison to their learning activities, and the final assumption is that self-regulation can mediate the relationship between the person, context and eventual achievement.

Zimmerman (2002) defined self-regulation as referring to “self-generated thoughts, feelings and behaviours that are orientated to attaining goals” and saw SRL as fulfilling a major function of education: to developing lifelong learning skills.

What defined learners in Zimmerman’s (2002) model was not the reliance on individualist methods of learning, but initiative, perseverance and learned skills practiced in both “social as well as solitary contexts”.

Each of these models describe a learner who is engaged in their learning, not just on a superficial level but from a metacognitive level. The use of metacognition and self-efficacy are essential activities in the SRL model, as the learner assumes some responsibility to regulate their learning environment, cognition and motivation to achieve a planned goal.

Winne and Hadwin (1998) adopted a narrower approach in their metacognition model of learner study regulation, looking at a “collage of environmental factors” affecting the cognitive areas where study occurs. Their four stage model of task definition, goal setting and planning, enactment, and adaption, saw coordinated sets of cognitive operations create “internal” products (strategies and tactics) by transforming the conditions (environment and context).

Two limitations of these existing learning frameworks become apparent from a learning identity development perspective. The first is that all are situated or intended to be situated within a formal educational environment with the intention of goal attainment. While there is a social and environmental aspect to each of the models, the assumption is that through cognitive regulation as method of management, obstacles to learning can be overcome. The implication is that self-regulation is a method of learner control rather than of learner development. Secondly, SRL in general is a cognitive process, stemming from a constructivism or social constructivism approach (Boekaerts, 1996; Falsafi, 2010; Dresel, 2015) to the development of self through the self-regulation of behaviours. While this approach works well within the domain of education where teacher pedagogical support is implied, it does not appear to have the flexibility and autobiographical narrative required to bridge the gap in learner identity development where the pedagogical responsibilities are transferred to the individual.

The final learning framework to be addressed in this section is Bouchard's (2009) theoretical discussion on what constitutes learner control as part of self-directed learning. Bouchard (2009) looked at what was required to transfer the regulation of SRL to the learner, and what are the dimensions (reasons/influencer) that affect the learner taking ownership of the learning activity. His model of Autonomous Learning Strategies (ALS) is constructed around four dimensions. The *algorithmic dimension* was primarily concerned with the learner assuming the teaching tasks of information and resource seeking and goal setting. The *conative dimension* looks at personal control, placing the learner at the centre of the act of learning. The *semiotic dimension* pertains not only to the information but the usefulness and appropriateness of the medium, search strategies and abilities of curation of the learner. Finally, the *economic dimension* is where the learner places value on the learning activity, from not only a monetary perspective, but an internal value assessment against the social, cultural and personal costs.

The *semiotic* and *economic* dimensions of Bouchard's (2009) ALS model have broad sociocultural connotations, the semiotic acknowledgement of the representation of signs and symbols as means of communication within a learner's environment. The *economic dimension* represents not only the real life pressures of modern life, but also includes the internalization of values that shape '*who we want to be*' aspects of identity.

This section has reviewed the learning frameworks of self-regulated learning (SRL) and autonomous learning strategies (ALS). A systematic comparison of the criteria within each of these learning frameworks is set out in Chapter 4 to establish their suitability for learner identity development. This comparative process also

identifies what criteria or processes can inform or be incorporated into the conceptual development of the Learning Informatics Framework.

These learning frameworks provide insight into the development of the learner as a student: the cognitive, motivational and regulatory functions needed to build the skills required to successfully achieve their academic goals. The SRL frameworks were ideally tailored to their function, but that is a limitation in terms of learning identity development. SRL relies on the existing learning environment to provide constraints and pedagogical support to the learner from a cognitive and constructivist approach. Bouchard's (2009) ALS moves the discussion outside the formal learning environment, and is concerned with how the learner would take ownership of the support and motivation provided in the traditional SRL methods. The dimensions approach of the ALS offers valuable insights and processes in the development of the Learning Informatics Framework.

Personal Informatics

This section of the literature review will explore Personal Informatics (PI) as a platform to support the development of the learning informatics framework. The concept of the Quantified Self will also be reviewed as an example of the potential of using PI as a means of learning identity development as an actionable concept.

Personal Informatics (PI) is not represented by a single technology, it is a diverse concept that it is best identified as a common theme, the collection of personal data by the individual for the purposes of self-analysis (Ohlin et al., 2015; Swan, 2013; Rivera-Pelayo, 2012; Lupton, 2014). PI itself is rarely identified as a thing, it provides the underlying concept and structure that is referred to by many names such as, quantified self, self-tracking, personal analytics, self-surveillance, lifelogging, and health informatics to name a few. This heterogeneous concept, is

equally as flexible in the type of tools and technologies that are employed as means of data collection. The '*tools or technologies*' can range from pen and paper to professionally designed applications and wearable computers (Ohlin et al., 2015).

For academia, the term personal informatics has two core activities as central aspects, collection of data and the analysis of (*participatory personal*) data to promote reflection (Ohlin et al., 2015). '*Participatory personal*' data refers to data that the made, owned and used by the user for self-awareness. Ohlin et al., (2015), believe there is an implicit third aspect to PI, one of procedural support that supports the collection and analysis through design, data representation and data driven prompts. This research embraces the interpretation of Ohlin's et al., (2015) premise of three core attributes included in a learning informatics framework are: collection support; procedural support; and analysis support. These broad support headings cover a wide range of possible criteria and are summarized in Table 1.

Core Attributes	Criteria
Collection support	Assistance to selection of data Prompts with predefined questions Sensors Temporality of collection method Support during manual entry
Analysis (reflection) support	Notification to check data Automatic data notification Goal/objective notification Periodic reporting Comparison to self Comparison to specific other Comparison to group Comparison to subjective benchmark
Process support	Goal/objective setting Planning Tool selection Motivation assistance Performance prompts and nudges Social peer/mentor/professional sharing

Table 1. *PI Core Attributes and Criteria (Ohlin et al., pp 94)*

The core attributes and criteria will provide the basis for the coding themes of interview analysis that are used during the data collection and analysis phases of the research methodology.

Participatory personal data exhibits many qualities of the culture surrounding the Quantified Self (QS) where self-tracking of daily activities helps the user know themselves and change themselves through the interpretation of their accumulated personal data (Wolf, Carmichael, and Kelly, 2010). The QS is a contemporary implementation of a PI system where the users of the popular health, fitness, financial and emotional tracking applications could be considered learner's in the pursuit of knowledge about themselves. Although the use of QS technologies to record and present data visually that represents the user's habits, behaviours and feelings (Lupton, 2014) are primarily a quantitative in method as they do tell the story of the individual's daily activities. While quantitative in approach, QS process could be described as a form of auto-narration through the language of numbers. Presently, QS leans philosophically towards a positivist and neo-liberal approach of "*self-knowledge through numbers*" (Ajana, 2017) which does not lend itself to the subjective appraisal of experiences and memories.

The separation between the proposed Learning Informatics Framework and QS can be defined by how personal informatics tools are employed and the culture that supports the self-observation activities. QS culture and supporting personal informatics technologies seek to define our "numerical" identity (Ruckenstein and Pantzar, 2017) and promote a framework to encourage individuals to question their "*datafied*" life. From this perspective, the QS frameworks primarily track emotions, diet, fitness, and sleep (to name a few) as a method for individuals to understand their bodies, minds, and daily lives as a series of quantifications that can be examined, understood and actioned for improvement (Ping and Epstein, 2015; Swan, 2013; Rivera-Pelayo, 2012; Cena, Likavec and Papp, 2014).

The Learner Identity Framework (LIF) would share PI as a common foundation with the Quantified Self (QS). Similar to the QS, the Learning Informatics Framework would provide the opportunity for individuals to rethink how their experiences affect everyday life through the interpretation of personal data. The Learning Informatics Framework would be concerned with gathering the subjective data from the autobiographic self-narrative, within the collection, procedure and analysis support process. The criteria would need to be tailor to capturing the life-stories of the learners in the collection support process, provide them the procedural support to remember and tell those stories and offering the opportunity to revisit those experiences through self-reflection analysis process.

For an individual to have an “*actionable* identity”, they must have control of the story they tell about themselves. This approach fits easily into the PI core attributes and enables a long term continuous method of capturing, curating and contemplating the events that shaped a learner’s memory of the learning experience.

With this perspective in mind an autobiographical narrative is considered participatory personal data when it is actionable and creates opportunities to empower individuals to become healthier, happier and more successful (Revera-Pelayo, 2012; Swan, 2013; Likavec and Papp, 2014). The work of Isaac et al., (2013) and McILveen et al., (2005) offer a possible way forward to make the autobiographical narrative actionable.

Isaacs et al., (2013) studied the differences between participants that only recorded (journalled) narratives of their daily events and those who went back and reflected on those entries. The results were of interest to this research; participants that only recorded their activities and those participants who use the record to reflect approach both experienced an increase in positive emotions from the act of narrating

their story. The group of participants that included a reflection activity saw additional benefits from being able to reflect and learn from both the positive and negative events. While the research was only carried out over a short period of time, making the long terms effects difficult to determine. However, the lead author who had been self-tracking using this format for four years (at time of research publication, 2013), found that her journaling experience and benefits experiences still matched those of the new participants.

McAllen et al., (2005), took the reflective journaling one step further by adding tailored parts of sentences (sentence starters) to assist the user to record the work day experiences using a narrative reflection process. The researchers found that “an individual would psychologically project onto part-sentences those career issues most meaningful for them”. Their research results showed no negative experience using the sentence completion method to generate a career narrative and on average the participants felt enhanced their narrative with “positive expectations of career exploration”.

Exploring the possibility of supporting the narrative development through the use of triggering questions or reminders to help the learner recollect and reflect on the events that affected them during their day (Cena, Likavec and Papp, 2014) was one of the objectives of the participatory workshop. The results of that process will be discussed in chapter four.

Holaday et al., (2000) and Rabin et al., (1985) suggest there is a strong commonality concept of “self/identity” development and popular personality assessment instrument of sentence completion test methods. Holaday et al., (2000) identified the use of the sentence completion approach to measure personality and

gauge behavioural habits. The strength of this method lies in the versatility, flexibility and the capability to be customized to meet the researcher's needs.

Rabin's et al., (2004) survey of researchers found that the use of tailored sentence completion tests added significant information for the researcher in areas of school behaviour, fear of failure and pride of achievement that was not present in the using interviews alone.

For the Learning Informatics Framework to employ a sentence completion method as criteria of procedural support, more in-depth research would need to be undertaken. However, from a conceptual point of view, it offers a means to develop and describe the Learning Informatics Framework components.

The final section of the literature on PI reviews Li et al., (2015) five-stage model (that will be reviewed as part of the framework comparison) of the personal informatics usage and adoption cycle (preparation, collection, integration, reflection and action). The research provides both a model of comparison to the SRL and development strategies to identify features that would help in user retention. The primary suggestions were, balancing technology mediation with ease of use, providing options to connect with and share data in social networks and ensuring interoperability with other analytic systems. Their research also looks closer at how people decide to start tracking, select PI tools, why they change tools and finally why people stop tracking. This will be important to testing the framework in future research and has a cautionary note for the Learning Informatics Framework development; not all learners will have the desire to start or the resilience to take the steps needed to make the actionable changes necessary for learner identity development. Yeager and Dweck (2012) in general define resilience as any behavioural, attributional, or emotional response to academic or social challenge that

is positive and beneficial for development that results from a person's interpretations of those adversities.

Technology has always been present in our lives, from the simple to the complex, both aiding and limiting how we think, what we know and how we know it. Using technology is not neutral activity, influencing individuals at the personal level, as well as, the social, political, gender and economic levels (Ajana, 2017). The action of influencing learning identity has been positioned in this research within the sociocultural theory paradigm (Lewis and Moje, 2003; Kirrschner, 2013). Our understanding of how personal informatics is used as a learning informatics framework will impact our ontological, epistemological and ethical assumptions. These questions have not been fully investigated in the literature reviewed or given the attention the topic deserves. The following chapters deals with the methods of data collection, analysis and findings as they pertain to addressing the research question.

Chapter 3 Methods of Data Collection

Introduction

This chapter will address the rationale for the selection of the research approach and methods used in this dissertation. It will also present the methodological perspectives that guide the research, the method chosen, the participant selection process, and finally the ethical considerations that are relevant to the research.

The selection of qualitative research theories and methodologies are often influenced by the intentions and goals of the research and researcher (Luo, 2011). As set out in the previous chapters, the aim of this research is to describe the components and technological systems that would constitute a Learning Identity

Framework. The long-term intention is to operationalize this framework into a suitable platform for testing in future research.

The intention to test the framework in the real world implies that the theories and philosophies that support the development of the framework should not only support the research goals of this dissertation, but also the broader concept of identity as an integral and reciprocal part of the act of life-long learning and self-reflection.

Sfard and Prusak (2005, p. 19) give the implications (testing the framework in the real world) importance when they state “It is now not unreasonable to conjecture that identities are crucial to learning. With their tendency to act as self-fulfilling prophecies, identities are likely to play a critical role in determining whether the process of learning will end with what counts as success or with what is regarded as failure”.

Findlay (2008) described self-reflection as being ‘mindful of self’ as the bases of a self-development process by being ‘attentive to and learning from everyday experiences as means of constructing a ‘lived reality’. From this perspective, it is reasonable to believe that the translation of personal emotions, experiences and feeling that support self-reflection are highly individualized and often a subjective activity.

Theoretical Foundation

To support this ‘mindful of self’ approach the ontological (nature of reality) approach taken is that individuals understand their world in unique ways that differentiates their understanding of reality from any other individual. This acceptance of ‘multiple realities’ (Braun and Clarke, 2006) forms the basis of the theoretical framework for this dissertation.

The research assumption that reality is unique to the individual is not built solely individualistically position, separate from the external world, nor is it believed that identity is socially constructed beyond the control of the individual.

The use of a sociocultural epistemology enables a qualitative approach based on the view that “learning entails transformations both of the personal and of the social world” (Packer and Goicoechea, 2000), influenced by affordances and constraints of systems of power and structure (public, political) (Fivush, Habermas, Waters, Zaman, 201; Sparkes, 2000; Martin, et al., 1988), which includes the impact of personal experiences, knowledge and memories simultaneously.

Methodologies and Methods

The *methodology* is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it. Thus, deductive reasoning should start with an understanding of the literature and move into analysis of the data, whilst inductive reasoning should start with the data and then test its conclusions against the literature (Twining et al., 2017).

Methodologically, this dissertation is qualitative and interpretivist. The choice of interpretivism over other approaches such as [social] constructivism comes down to the interpretivist acceptance of multiple-identities, and the view that research is a process of interaction between the participants and researcher (Edwards and Holland, 2013; Schwandt, 1998; McLveen, 2008) and subject (Goldkuhl, 2012).

Figure 1. (adapted from Twining et al., 2017 pp A2) shows the hierarchy of theories and methodologies. So far, this chapter has briefly discussed the theoretical stance and methodologies. The following section will cover design and methods, while Chapter 4 will look at the analysis portion of the research.



Figure 1. Theories and Methodologies Hierarchy (adapted from Twining et al., 2017, pp A2)

Research Design and Methods.

Guided by the research questions, the theories and methodologies (Figure 1.) allowed a process of development and exploration to guide the gathering of data as an interactive process with the researcher and participants. The exploratory nature of the research design of interviews, participant feedback and framework comparison favoured qualitative methods that lent themselves to the use of an iterative cycle of deductive “theory to observation” and inductive “observation to theory” knowledge building. This approach provided for a flexibility research plan that had both deductive elements in the case of the framework comparison and inductive elements in the process of allow emergent themes to through interview analysis (Braun and Clark, 2006; Genzuek, 2003).

While the research methods were guided by a level of directness from the researcher’s part, in the choice of using personal informatics as the foundation for the identity framework resulting from the documents and the selection of the PI core

attributes (Ohlin, 2015) as the main coding themes for the interview transcriptions, the research remained open to emerging data. This approach (Figure 2.) was intended to place “the dot on the page” as a starting point to begin the exploration of what components would comprise a Learning Informatics Framework, give a point of reference to assess the views of the participants and to establish a consistent analysis theme across all three phases of the research methods.

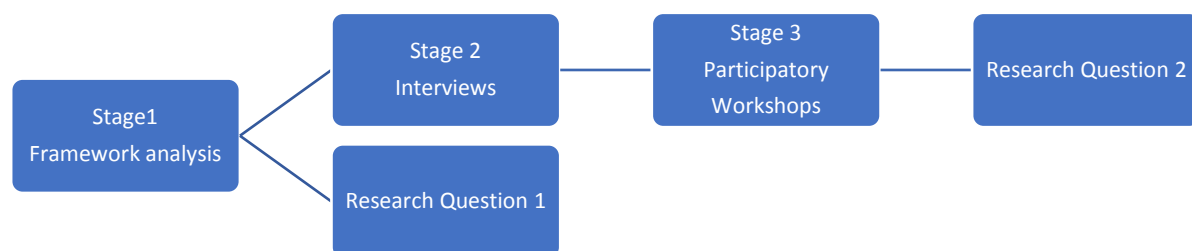


Figure 2. Data Gathering Flow Chart

Existing Framework Comparison

The first stage of the research was to compare the personal informatics core aspects to a representative sample of existing learning frameworks looking for compatibility and emergent ideas. The comparison, set out in Chapter 4, looks at framework approaches to the SRL, ALS and PI frameworks (Zimmerman, 3 stage SRL model, 2002; Winne and Hadwin, 4 stage SRL model, 1998; Pintrich, 4 stage SRL model, 2004; Bouchard, 6 Stage ALS model, 2009 and Li, 5 Stage PI model, 2010) and examines them in relation to the common coding themes derived from Ohlin's et al., (2015) core aspects of a personal informatics system (Table 1.).

The use of these common themes to compare the selected existing learning frameworks allow for the explorations of differences and similarities between Self-regulated learning (SRL), Autonomous Learning System (ALS) and Personal

Informatics models (PI). The results will inform and guide the initial description and conceptualization of the Learning Identity Framework.

Interviews

The semi-structured interview process was not specifically designed to answer questions on how to construct a Learning Informatics Framework, but to start a discussion with the interviewee on their opinions and perceptions of using a process of self-narration and self-reflection to develop a learner identity framework.

The semi-structured question (Annex A) asked their opinion on using self-reflection as a means to building learning identity, the process of using technological support to help the learner track their daily learning journeys and the final question offered them to expound, clarify or return to a topic of the interview.

An list of candidates that had expertise in the various fields of research that support quantified self, self-assessment or self-regulated learning was prepared by the researcher, based on social network connects, consultation with supervisors and staff at the Open University.

The realities of availability in the summer months, scheduling conflicts, and the participants' desire to participate in the interviews introduced a degree of convenience to the sampling process. The intention to have as many of the interviews face to face as possible resulted in a tendency to use academics from the Institute of Educational Technology (IET) for convenience and accessibility.

A total of five interview participants agreed to be interviewed, with four ultimately participating. One volunteer was not able to participate due to scheduling conflicts and time constraints prevented finding a replacement. In all, two OU staff, one recent OU PhD graduate and one professional executive coach were interviewed. The interviews with the Open University staff were carried out on

campus, and the remaining interviews were carried out via Skype, initiated by the participants from their location and at a time of their choosing.

The formal interviews lasted, on average, fifty minutes and ended when the interviewee seemed content that they had been given ample opportunity to express their opinions on the questions. The semi-structured format was also used to maximize the time available to the researcher and by providing the questions in advance allow both sides of the interview to be prepared and focused.

The post interview work involved the transcription of the interviews into text to be analysed for commonality to the core informatics codes and to discover emergent themes that existed in each of the interviews. These transcripts were augmented with notes taken during the interview and observations that were made by the researcher during the transcription process.

A thematic analysis approach was selected as the method for interview analysis for this research as a method of “identifying, analysing, and reporting patterns (themes) within data” (Braun and Clark, 2006). Two phases of analysis were undertaken. The first used the PI core attributes as themes for the analysis, aligning the process with a ‘theoretical’ thematic analysis (Braun and Clark, 2006). This process, being driven by the researcher, was intended to explore the connection between the interviewee responses to the core attributes of PI framework. The limitations of this approach are a tendency to yield a less detailed description of the interview data overall (Braun and Clark, 2006). In the second phase, an inductive thematic analysis approach was used to look for the emergent or latent themes that may have been missed in the top-down approach. The observations, themes and assessments from the interview analysis were then used to prepare the materials for the participatory workshop, the third of the research methods.

Participatory Workshop

A workshop was held with potential users to validate the usefulness of the proposed learning informatics framework.

The participatory workshop format (TESS, nd) was primarily a collaborative session that brought a group of volunteer participants together to consult with, seek opinions and problem solve in a safe environment. This workshop lasted two hours and included a component that require the participant to individually complete the assigned assessment worksheets without group discussion

The broad goals of the workshop were to gauge the reaction of the participants to the concept of using a Learning Informatics Framework to build learner identity and receive participant feedback and verification on the researcher interpretation and conclusion to this point of the research. On a more focused level the workshop surveyed the participants about their individual reactions to the learning informatics framework and narrative support process (sentence completion frames). They were then asked to rate each of the components independently against a predefined scoring matrix and to discuss the validity of the process as a group.

The secondary goal of the workshop was to offer the participants an opportunity to make suggestions or insights to the framework development in a collaborative forum. The interaction during the forum was also an opportunity for the researcher to observe and make notes on the impression of any emotional reactions the participants had with regards to the concept of a Learning Informatics Framework, while asking the group general questions about their perception of self-tracking, journaling and self-reflection.

The workshop participants were all volunteer PhD students from the Institute of Educational Technology (IET) at the Open University. The PhD students were recruited by posting a request to volunteer on a private IET student only Facebook page.

While the cohort of PhD students was known to the researcher, the identities of the six volunteers who finally participated were unknown to the researcher until the start of the workshop session.

Before beginning the workshop, all participants were pre-briefed on the format and requirements of the workshop, security, and options to withdraw. Each participant was afforded an opportunity to ask questions, clarify any concerns or withdraw before the formal portion of the workshop commenced. The workshop was not recorded electronically: only the researcher's notes and survey questionnaires (pre-anonymised via random numbers) were retained.

The primary research data derived from the workshop was the survey sheets that each participant of the workshop completed independently. Supplementary data was the researcher's notes and observation from the interplay between the participants in relation to the framework concepts and their reaction to the self-reflection as a general concept for self-development.

Ethics

The dissertation and research conducted in support of the thesis conformed to all of the ethical considerations prescribed by the Open University (OU, 2017) and British Educational Research Association (BERA, 2011) "Ethical Guidelines for Educational Research". The researcher did not in any circumstance, situation or location conduct research that harmed the participants. All data security and retention requirements of the Open University (OU, 2017) and BERA (BERA, 2011)

were adhered to for the safe storage of research material. The Open University Human Research Ethics Committee (HREC) Project Registration and Risk Checklist was completed and ethical approval given (ref HREC 2016/20333 Mercer).

Participants of the semi-structured interviews and the participatory research group sessions voluntarily provided informed consent for the interviews and group activities. The consent form included permission for audio recording (for the interviewees only) during the discussions and subsequent use in the final analysis of the research methodology. All quotes or references to interviews were anonymised by assigning numbers to exemplar and workshop participants.

All participants were briefed on the rationale for the research. The interview participants were provided with a list of questions and topics to be discussed and the participatory design participants were given a briefing on expectations and a handout worksheet before the session commenced. They were also advised that they could withdraw at any time, any data pertaining to them returned and their participation not be included in the final research results.

There were no issues with gatekeepers or special permissions needed to access interview participants within organisations.

Chapter 4 Data Collection and Analysis

Introduction

As set out in Chapter Three, the research design and methods use techniques from an ethnographic informed approaches to data collection and analysis, as they closely matched the objectives of the research. This method was chosen primarily to enable the researcher to explore and understand the participant's beliefs, assumptions and interpretations of the Learning Informatics Framework in a

collaborative manner, in comparison to other quantitative techniques and methods (Hammersley and Atkinson, 2007; Johnson, 1997).

This chapter will discuss the data collection process of the framework comparison, interviews, and participant workshops, the associated analysis of the gathered data. It begins by acknowledging the researcher advocacy (reflexivity) in relation to this research.

Researcher Predisposition

The predisposition of the researcher is of importance to the data collection and analysis as it introduces a layer of bias that may affect the research process and findings. The process of reflexivity involves the researcher questioning their predispositions and biases as part of the research and analysis process (Hammersley and Atkinson, 2007; Twining, 2017).

In the literature review similarities were drawn between Findlay's (2008) "*mindful of self*" as part of the act of self-reflection and Foucault's technologies of self as a means of "*transform themselves*". In the comparison a level of personal advocacy was introduced as a result of the researcher identifying with lifelong learners who have had repeated negative experiences within the formal educational system resulting in a diminished self-view of their learning identity. The advocacy takes shape in the belief that lifelong learners should have the tools to take ownership of their learning identity development to resist the "*self-fulfilling prophecies, identities are likely to play a critical role in determining whether the process of learning will end with what counts as success or with what is regarded as failure*" (Findaly, 2008).

These experiences place the researcher in the position of choosing between ignoring the emotions caused by the exploration of learning identity through the

process of this dissertation, or acknowledging them as part of the research focus and design. In this dissertation, the choice was to use the researcher's perception of his learning identity and academic experiences to frame and guide the research.

The design of the research offered several means for the researcher to compare perceptions against: a wide range of literature, the views and professional opinions of the interviewees through the interview process, and through involvement with peers during the workshops. Each stage of the process required the researcher to see the data through the filters of experts in the learning technology field, published literature and peers, forcing an internal examination and comparison to personally held beliefs. This approach allowed the intended advocacy to guide the research but not unduly influence the validity of the research findings.

Existing Framework Comparisons

Five existing learning frameworks from self-regulated learning (SRL) (Pintrich, 2004; Zimmerman, 2002; Winnie and Hadwin, 1998), Autonomous Learning Strategies (ALS) (Bouchard, 2009) and a Staged-Based Personal Informatics model (Li et al., 2010) are compared in the first step of the research data gathering process. The comparative process will use the core informatics themes (Table 1.), located in the analysis section of this chapter, to eliminate frameworks that do not match the core attributes and through the comparative process select a framework or series of framework attributes that would could support the development of the Learning Informatics Framework.

SRL was the most widely referenced in learning framework in the literature review in Chapter 2, so to ensure a proportional representation three variations were included in the comparison process. The evaluation was a comparison method that looked at the criteria of each one of the phases/stages or dimensions of the selected

frameworks and attempted to match to the PI core attributes identified by Ohlin et al., (2015). An example for this process is shown in located in the analysis section of this chapter.

The process of matching was carried out for all five of the frameworks, and established that three of the five frameworks matched the PI core attributes in all areas (Table 4.).The remaining three frameworks were then reviewed to establish the context of their intended application and method of utilization (Table 5.). The review of the intended focus of each of the learning frameworks was carried out with the goal of defining the scope and context of the frameworks and how that might apply to the Learning Identity Framework development or future research as part of the analysis process.

Interview Data Collection

The interview approach was thematic in design but was also intended as a dialogue and exchange of ideas (Edwards and Holland, 2013). Three questions (Annex A) formed the guide for the semi-structured interviews and provided to the interviewee in advance to allow them to familiarize themselves with the intent of the interviews. All the interviewees were academic or business professionals who had expertise or recently completed research on similar topics. The relationship was one of learner/researcher to experienced professional with the researcher gaining valuable knowledge, as well as, engaging in useful exchange of ideas.

During the process of editing and rewriting this dissertation, some terminology used to describe and provide theoretical grounding to the research has matured, linked to literature that provides a sounder theoretical foundation, and greater refinement of the concept. This has caused a difference between the terminology used in the interview questions and those used in this dissertation, but the context of

the interview questions remains valid and useful for the revised research questions. In summary, what was called Personal Learning Informatics (PLI) in Annex A is now referred to as the Learning Identity Framework, 'learning agency/autonomy' is now 'learning identity' and what was called 'PLI indicators' is now broadened to narrative assistance.

The interviews were audio recorded and subsequently transcribed to text for analysis. Braun and Clarke's (2008) thematic analysis guide and Patal's (2015) thematic approach to struggling students provided the context and approaches used to code and theme the text for final analysis.

The semi-structured interview allowed the interviewee to discuss the topics and issues from their unique and professional experiences. Each interview had an opening discussion (about ten minutes) that was not recorded in order that the researcher and the interviewees had an opportunity to acquaint themselves with each other and ensure the interviewee were comfortable with the format and question. This was followed by the recorded portion of the interview that lasted about 50 minutes for each of the interviews. The questions were designed to probe two specific areas and the last question allowed for follow-up questions in areas of interest or new areas that emerged from the conversation.

The first question asked if a learner can be expected to develop agency/autonomy [identity] through self-assessment with the goals of positively modifying behaviours and habit towards learning activities, was introduced to get the interviewee opinion on the primary function of the Learning Informatics Framework. The second question focused on narrative support from the context of sentence frames as a means to recall memories of daily events with the intention of using the narratives for self-reflection.

Participatory Workshop

The participatory workshop was included in the data gathering and analysis to provide peer feedback on the proposed identity framework and gauge reactions to the narrative support concepts. The workshop, while primarily a group discussion on self-assessment as a means of self-reflection did include an individual survey (questionnaire) that was carried out during the session. The data was derived from researcher notes, results from the survey and feedback from the participants.

The same changes to terminology described in the interview process section also affect the analysis, and the session information and questionnaire are present in the participatory workshop

Data gathering from the survey/questionnaire was designed to give first impressions or spontaneous reaction to the narrative support examples. The participants were briefed to give a “gut reaction” to the narrative support prompts and situate those reactions on a customized version of the commonly used Eisenhower Decision Chart that offered four quadrants of choices (Table 2.).

Important and will answer	Important and will not answer
Not important and will answer	Not important and will not answer

Table 2. Workshop Decision Chart Example.

The Eisenhower Chart provided data in two way, firstly, did the participants feel the narrative support prompt was important in supporting self-reflection and secondly, would the participant feel comfortable answering that question. The individually completed Eisenhower charts were collected for analysis and observational notes were taken during the activity. In retrospect it may have been

advantageous to have the participants fill the questionnaire out before attending the workshop thus freeing more time to discuss the results, but the exact participants were not known to the researcher until the workshop began.

The group session discussed and solicited the participants' views on the Learning Informatics Framework, and they were canvassed about their habits in respect to fitness tracking, journaling/diary keeping as a learning tool, and self-reflection as means to overcome personal learning difficulties and failures. Notes were taken during this portion instead of audio recording to prevent participant reluctance to speak freely amongst peers and the complexities of building a transcript from the overlapping and cross-talk conversations. The observational portion of the notes also provided references to body language and attitudes of the participants.

The participants were also provided a group opportunity to suggest new or missing narrative support statements that they felt were missing from the samples provided.

Analysis

Framework Comparison Analysis

The comparison of the representative learning frameworks was designed to discover to what extent the existing learning regulation frameworks met the core themes of a personal informatics system (Ohlin et al., 2015). The process of matching the criteria proved to be a deductive process (Table 3.) as the criteria for each of the frameworks were customized to the individual research study or application that was intended by the researcher. This validity of the matching process was maintained through a careful review of the learning framework literature

to develop an understanding of the context or application intended for the framework which often gave meaning to the criteria found in each of the research articles.

PI Core attributes/themes Collection support: <ul style="list-style-type: none"> • Assistance to selection of data • Prompts with predefined questions • Temporality of collection method 	LI, Stage-based model Collection Stage: <ul style="list-style-type: none"> • Select information to track • Decide frequency of collection
Process support <ul style="list-style-type: none"> • Planning • Tool selection • Motivation assistance • Performance prompts • Social sharing 	Bouchard, Autonomous Learning Strategy Algorithmic Dimension <ul style="list-style-type: none"> • each individual uses learning materials in a specific way • A self-directed learner does not have a ready-made course-pack • Life transitions and professional development goals must be translated into manageable learning goals. This

Table 3. Criteria Comparison Example

During this process, it was noted that none of the frameworks sampled were employed as methods of intervention. All were a result of studies of the habits of existing student habits. Li et al., (2012) was an exception to the educational setting: their study was of general participants not engaged in formal educational activities.

The matching process established that two of the five frameworks did not match all of the personal informatics core themes and were therefore dropped from the remaining data gather and analysis (Table 4.). The choice of not continuing to use the Zimmerman, (2002) and Pintrich's (2004) frameworks was not a comment on their broader usefulness or validity, but simply that their focus and intent did not provide the criteria to match to a common personal informatics system. This might be partially attributed to the framework designs accommodating the role that student

management systems play in formal education systems as a means to off-load collection support to pre-existing structures/systems.

PI Core Themes criteria for comparison	(ALS) Bouchard, (2009)	(PI) Li et al., 2010	(SRL) Pintrich, (2004)	(SRL) Zimmerman, (2002)	(SRL) Winne/Hadwin (1998)
Collection support: <ul style="list-style-type: none"> Assistance to selection of data Prompts with predefined questions Temporality of collection method 	Conative Dimension	Collection Stage			Stage 3: Enactment study tactics and strategies
Analysis/reflection support <ul style="list-style-type: none"> Data notifications Objective notification Periodic reporting Comparison to self Comparison to specific other Comparison to group Comparison to subjective benchmark 	Semiotic Dimension	Integration Stage Reflection Stage	Phase 2. Monitoring	Self-Reflection Phase	Stage 4: Metacognitively adapting study
Process support <ul style="list-style-type: none"> Planning Tool selection Motivation assistance Performance prompts Social sharing 	Algorithmic Dimension Economic Dimension	Preparation Stage	Phase 1. Forethought, planning and activation Phase 3 Control Phase 4 Reaction-reflection	Forethought Phase Performance Phase	Stage 1: Task definition Stage 2: Goal setting and planning

Table 4. Learning Framework Comparison Table.

The framework comparison provides a method to develop and describe the process and stages that would in part work towards providing a finding for the RQ 1. The remaining three frameworks were then reviewed to establish the context of their intended application and method of utilization and is shown in (Table 5.). The review of the three remaining learning frameworks we reviewed to defining the scope and context of they might apply to the Learning Informatics Framework development or future research.

Bouchard Autonomous Learning Strategies	Li et al., Stage based Model of PI	Winnie and Hadwin Metacognitively powered Self-regulated learning
Study was direct at professional learning with the objective to discover the dimensions of self-directed learning. Looking at each of the semiotic dimension as possible means to promote or hinder effective learning behavior. This framework approached the process from the perspective of the individual assuming responsibility of the teacher/instructor role.	Focus was left to the participants of the personal informatics study, topics were defined as “most relevant” were finance, journaling, exercise and general health. Study data gathering was centered on why individuals selected PI tool, started self-tracking or ceased to track	Study looked at what stages could be used to enact a self-regulated study framework. This research concentrated on the (meta)cognitive events that shaped study activities not school learning activities supported by a teacher.

Table 5. Learning Framework Focus Comparison Chart.

The analysis of the data provided three outcomes. Firstly, the core themes of the personal informatics system mapped on to three published learning frameworks. Secondly, the criteria of the framework themes was flexible in description but still mapped to the common core themes of PI. Lastly, none of the frameworks surveyed were implemented as learning behaviour modification tools, but represent attributes and processes that supported the concept of SRL, ALS or PI.

This approach closely adheres to Li's et al., (2012) definition of PI as a system: a collection of tools that through human computer interaction help people

collect personally relevant information for the purpose of self-reflection and gaining self-knowledge.

Interview Thematic Analysis

The primary goal thematic analysis of the interview data was to provide and answer to research question two: In what ways do the views of learning technology experts and potential users support the development of Learner Informatics Framework?

The use of the core attributes that define a personal informatics system as coding themes provides continuity from the framework comparison to the interview analysis, demonstrating a level of confidence that the interview responses will also support the stage/dimension criteria established in the framework comparison data.

Two forms of thematic analysis were carried out on the interview data. As set out in Chapter 3, the first was a '*theoretical*' approach to the analysis followed by an 'inductive' "bottom up approach" similar to a grounded theory model (Braun and Clarke, 2006 p.12). Patel et al., (2015) method was quite similar using the term "Definitive" in place of Braun and Clarke's *theoretical* approach to describe a deductive "fixed and specific procedures" as a top down method.

The theoretical approach allowed for a top down approach that uses the core PI themes as a means to analysis the text for specific research areas of interest (Table 6.). Two of the four interviews were coded by a separate individual to check for researcher bias. The results showed a high similarity in outcomes, with the second reviewer finding slightly more alignment within the text in comparison to the themes. The theoretical approach was balanced by looking at the interview data a second time using the inductive thematic approach that allows for a more data-driven process to look for emergent themes (Table 7.)

Coding Themes	Interviewee	Quote
Collection Support	EX1	Something like a fitness tracker but with the ability to easily annotate, make a quick note, an important note
	EX2	We need that narrative in order to have behavioural modification[...]
	EX3	[...]universities are picking up on[...] getting students to self-reflect on [...] how am I feeling today and your attitude to learning[...]
	EX4	If I'm in a critical moment[...]I tend to journal my way through the hurdle[...]
Analysis support	EX1	Help them to go back to something that they were interested in and could recall that context
	EX2	[...]goes for self-assessment where it looks for[...]behaviour modification[...]you have to look for it really hard to start living it[...]to have [the] shifts happen in our behaviours[...]
	EX2	[...]so there are some kind of reflection theory between[...] the view we have of ourselves and that [view] someone else is challenging...
	EX3	[...]to be better at self-directed study you probably need to be aware of what makes you study better[...]
	EX4	[...]if I'm kind of down or trying to hinder myself[...]then I start to journal[...]
	EX1	Something like a timeline, where you could see the things people were doing.
Process support	EX2	[...] must have somebody help you remove those limiting [self] beliefs..
	EX3	[...]structured in a way that allowed for all the differences in personal habits [to adapt for]..
	EX3	[...]they [universities] haven't cracked that yet on the reward driven learning stuff[...]
	EX4	I think there is an option to self-regulate and increase your learning outcomes in a way of knowing yourself

Table 6. Interviewee Response to Coding Themes.

Emergent Themes	Interviewee	Quote
Language	EX1	[...]a language to be able to talk about your writing [learning] process[...]
	EX1	[...]appropriate meta-language for learners to use to describe what they are doing to themselves in ways they understand[...]
	EX2	[...]the mind set behind and how they even word those goals[...]
Learning Rhythm	EX1	[...]going to have happy days and sad days and that's part of the rhythm[...]there is a rhythm of writing, and a rhythm of learning and studying[...]
	EX2	We need to each find our way that is impactful, powerful[...]we need to be individuals[...]
	EX4	Absolutely, the least productive in the afternoon, [...]but like creative thinking or having ideas in the morning[...]
	EX1	To break out of that cycle of despair you need to have some really strategic input from people who can say[...]you are not alone.. are not unusual

Identity	EX2	We call it the imposter syndrome, I'm going to wake up and I shouldn't [be] in this position and I don't deserve it[...]
	EX2	[...]our background is such that we do not deserve to be in this kind of job[...] not in my genetic makeup[...] more successful than my family[...]as self-limiting beliefs
Intentions	EX1	For me it's an intention not a goal a goal is like finite end result[...] intention is a way of being that will keep your commitment[...]
	EX1	[...]we measure our intentions against our actions every single day[...]so intentions equal results.

Table 7. Interviewee Emergent Themes.

The interview analysis was one of the primary sources of data to address RQ2 which asked if the interviewees as learning technology experts supported the development of the learning informatics framework. Their responses were compared to the themes associated with common attributes of a personal informatics system (Table 1.) as the platform for a learning informatics framework to establish support or concern.

The overall results from the thematic analysis show a strong agreement between them, with all interviewees supporting each of the three core themes.

During the coding of the interviews in relation to core attributes the experiences and context was different for each of the interviewees and require some level of interpretation to match the intentions of the statement to the core attributes. The following examples give some insight into the process of interpretation,

Within the theme 'Process support', the criterion 'social, peer, mentor, professional sharing' matched to EX2 quote "[...] so it is almost impossible to be able to self-assess [...] to the same depth as working with an external [person]", suggesting that EX2 considered that sharing the results of the process with some external person was important. The process support criteria planning for EX1 "Something like a timeline, where you could see the things people were doing". Reflected EX2 that use of time management was important as a planning tool not

only for the individual, but also for external sharing. When the review process was turned to analysis (reflection) support, EX4 picked up on the comparison to self and also comparison to specific other as criteria *“It has to be social and they have to understand themselves in relation to the social world”*. EX 3 spoke from his recent experience assistance to data collect as part of the core theme collection support “[...] universities are picking up on [...] getting students to self-reflect on [...] how am I feeling today and your attitude to learning[...].

Of the emergent themes (Table 7.) that resulted from the analysis, Body Rhythm showed a strong commonality across the researchers. EX1 implying the need for self-tracking as a means of self-awareness “[...] how do I understand the rhythm of my working [...].to reconcile yourself to that rhythm and how to make that rhythm more productive”. Identity was also present in the emergent themes, mirroring Knights and Clark, (2014) literature in chapter two, with EX2 describing imposter syndrome “[...]our background is such that we do not deserve to be in this kind of job[...] not in my genetic makeup[...] more successful than my family[...]as self-limiting beliefs”.

Overall, the interview analysis showed a high level of support for the concept of a Learning Informatics Framework and offered one emergent theme that could have impact on the development of a learning informatics framework: the need for a shared vocabulary.

Interviewee EX1 spent significant time during the interview commenting from experience on the need for a common working vocabulary that conveys meaning during the self-narrative. They described the narrative support as “[...] a language to be able to talk about your writing process [...]” and “[...] appropriate meta-language

for learners to use to describe what they are doing to themselves in ways they understand[...]" (EX1).

Participatory Workshop

The primary goal of the participatory workshop session was to expose the research ideas and concept of using a learning informatics framework as a means of narrative support to potential users (peers) and receive initial feedback impressions.

Data gathering was a mix of survey information and observational notes, the survey portion of the workshop provide the participants a selection of narrative support statements. The questionnaire listed 30 narrative support questions (Annex B) that were scored against the customized version of an Eisenhower decision chart, that offered four quadrants of choices (Table 8.).

The Eisenhower decision matrix evaluates tasks using the criteria important/unimportant and urgent/not urgent through a visually simple four quadrant box. Its primary function is to quickly and easily sort competing tasks in priorities (Baer, 2014). The requirement for a research instrument that was simple, visual and had a proven format to assess tasks into categories lead me to customize the Eisenhower matrix by substituting the evaluation criteria of "Will answer/will not answer" for the traditional "urgent/not urgent". The use of the customized chart was successful as it required almost no explanation and not one of the participant had problems or questioned using it to complete the assigned tasks.

The data gathering for the survey questionnaire was an aggregate total of all the responses in each quadrant which were then converted to percentage to give an indication of first impression of importance and willingness to answer each of the 30 questions. Out of 180 possible responses 142 were scored, one participant did not hand in their worksheet and 8 other questions were not score amongst the remaining

five worksheets. The participants in overall terms were supportive of the concept of narrative support with a majority of responses assigned to the important and will answer quadrant (Table 8.).

Important Will answer 66% of respondents	Important will not answer 20% of respondents
Not important will answer 11% of respondents	Not important will not answer 3% of respondents

Table 8. Participant Responses in Percentage

While the data is broadly positive, an interesting question lies in the 20% of responses that indicated that the participant believed the narrative starter question was important, but they would not answer it. A review of this “important and will not answer” quadrant showed 29 responses selected by more than one participant. These questions predominately dealt with wellness, diet and fitness and self-reflection through critical evaluation of goals. This reluctance to answer questions that the individuals indicated were important may have just individual’s reluctance to answer the question or possibly linked to issues of the language framing of the questions contributed to the negative response.

The observational notes from the workshop indicated that in general the six participants in the workshop were supportive of the Learning Informatics Framework concept – indeed, two requested to be included in trials of the framework. Interestingly, one of the participants, while indicating that they support the overall concept, indicated that they would not want to reflect on failure or negative events, asking rhetorically, “Why would I want to relive the event again?”.

Several other points of interest surfaced in the survey responses. None of the participants had (ever) self-tracked fitness or diet. This was surprising because they were all avid smart phones users that had health and fitness apps built into the

phone operating system. Also, none of them were currently using a journal to document the educational PhD journey or used any other means of recording self-narration for the purpose of self-reflection.

The analysis answers RQ1 by showing that the majority of the participants both support the learning informatics framework development and positively reacted to the concept of narration support. However, even with the majority of narrative support tasks being scored in the “important will answer” quadrant, further research is warranted into the positive psychology aspects (Botella; Riva et al., 2012) of using this method.

Chapter 5: Conclusions

The broad aim of the research was to explore the concept of using a technology-mediated platform to support the positive development of learner identity.

Conceptually, the research draws from a wide spectrum of literature spanning lifelong learning, learning identity, quantified self, regulated learning frameworks personal informatics and positive technology. Each of the diverse field of literature provide insights into what would constitute a framework capable of supporting learner identity development. It was necessary to build this conceptual idea of what would comprise a learning informatics framework before the primary research question could be addressed.

RQ2 looked at how the views of the learning technology experts and potential users supported the development of learner informatics framework. Data from the interview and participatory workshop was primarily used to answer this question.

A strong level of support was present in each of the interviews. When asked if they believed that learners can develop learner agency/identity through self-assessment outside formal school environments, all reacted positively with EX1

stating “Absolutely, yes I do believe that” and EX2 responded with “definitely”. This positive sentiment was corroborated by the theoretical analysis (Braun and Clark, 2006) of the text where all the interviewees matched easily to each of the core themes, in several cases more than once.

Additionally, there was a high level of agreement between the interviewees and the core themes. For example, when discussing self-observation/tracking in the interviews, one interviewee said it would “*Help them to go back to something that they were interested in and could recall that context*” (EX1); another raised the context of self-observation: “*If I’m in a critical moment[...]I tend to journal my way through the hurdle[...]*” (EX4); and another observed that “*[...]universities are picking up on[...] getting students to self-reflect on [...] how am I feeling today and your attitude to learning[...]*” (EX3).

While each of the interviewees framed their responses based on their background or professional experiences, there were strong similarities in their views towards the Learning Informatics Framework. All expressed support for the process of using a technology base for self-reflection. Similarly, each felt that there was a strong need for a social component and external input to ensure the learner had positive benefits from the act of self-reflection.

The workshop participants were also generally supportive of the development of the Learner Informatics Framework. Through group discussions and questionnaires that gauged their reactions and willingness to answer questions that would be similar to the self-narration component of the Learning Informatics Framework, an understanding of the participants as potential users emerged. While all participants indicated that they supported the concept of Learning Informatics

Framework, one participant questioned the need (or desire to do so) to relive negative experiences through self-reflection.

This comment highlights the need to have a clear understanding of the language and words that comprise any narrative support method. Following the words of caution from interviews EX1 and EX2, this is an area that would benefit from further research.

The framework comparison was the method to address the RQ 1, the data resulting from the comparison of existing learning frameworks and the core attributes of PI. The approach of comparing the various frameworks against the core attributes provided a means of “triangulating” the commonalities of the matching frameworks and filtering out those who did not meet the established criteria.

As discussed in Chapter 2, personal informatics is the “primary term within academia to describe activities aimed at self-understanding through collection and analysis of personal data” (Ohlin et al., 2015). It became apparent through familiarity with the work of Ohlin et al., (2015), Li et al., (2010), Ping et al., (2015), and Muller et al., (2012) that it is not so much a technology as it is a heterogeneous technology system that allowed for a wide spectrum of user select tools. This flexibility made it ideally suited to be the foundational system for the Learning Informatics Framework and to provide the bench mark for the framework comparisons.

The comparison showed that three of the five frameworks suitably matched the core attributes of the PI system (Table 4.) and the commonalities, as well as the unique features of each provided the template to describe the components of the Learning Informatics Framework.

The results indicate that the most promising conceptual model for the learning informatics framework shown in (Figure 3.) and would integrate of relevant aspects

of Bouchard's (2009) Autonomous Learning Strategies within the three core attributes of a personal informatics system.

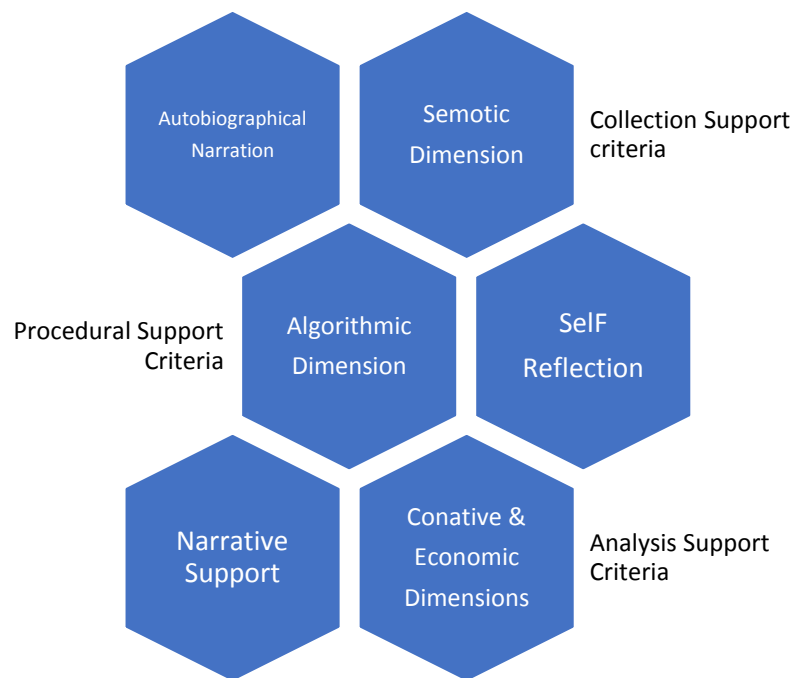


Figure 3. Learning Informatics Framework Components.

As set out in Chapter two, the five dimensions associated with the Bouchard (2009) model acknowledge the sociocultural aspects of identity development, understanding that learning is influenced by broader social, cultural and economic forces. The algorithmic dimension points to the importance of the learner being supported in the process of taking ownership of their learning activities. The conative dimension reminds us that the learning is a personal experience, influenced by self-knowledge, self-esteem and metacognitive factors (this dimension encompasses the Winne/Hadwin (1998) model). The semiotic dimension points towards the need for 'collection support' as the learner navigates through the act of finding and curating information. The economic dimension pragmatically acknowledges the cost of learning, and value to the individual of the knowledge gained.

The integration these five dimensions into the learning informatics framework, while ensuring the lessons learned through the comprehensive list of the problems

that people experience in adoption, and cessation of use of personal informatics provided by Li et al., (2010), would provide a model to be operationalized for future testing and trials.

Limitations

All research brings with it limitations, introduced by the decisions the researcher makes in the design, development and analysis of the research data. Often these are introduced without awareness of the researcher, whereas others are the result of pragmatic choices made during the research.

The introduction of a unique learning framework centred on the development of a learner identity outside the formal learning environment brings with it problems of where to situate it theoretically, methodological and pragmatically. The choice of situating the Learning Informatics Framework in a sociocultural context was made to acknowledge the broader and social influences affecting learning identity. A limitation of this approach lies in the gap in literature and theoretical research into learning identity development (Coll and Falsafi, 2010; Fassafi, 2010). As research continues, the theoretical and methodological situating of the Learning Informatics Framework may shift or become part of a new context stemming from the philosophy of positive computing (Calvo, 2006).

While the development of new theoretical foundations and further research may seem far off, the choice of sample size and the limitations of participant selection are more pressing. The main limitations of this study lie in the small sample size in the number of interviewees and participants. The research would have benefited from a larger sample size of interviewees and a broader range of backgrounds and experiences.

A second sample size limitation is the number of learning frameworks to compare. A larger number of learning frameworks based on self-regulation, self-directed, and personal informatics may have yielded results that had a stronger validity (Twining, 2017).

The use of the participant workshop could have been accomplished through surveys and questionnaires that covered a wider spectrum of potential users of the learning informatics framework. However, the more ethnographic approach was purposely selected to ensure there was researcher-to-participant interaction, which could have been lost in the more quantitative approach.

Expectation control is not a limitation often mentioned, but it is considered important to note from the researcher's point of view. The learning informatics framework is not conceived to be used at large scale. It is an individual tool. The learner who chooses to use the Learning Informatics Framework will have decided that they want to commit to learning more about their learning habits and through self-reflection have a positive influence on their identity. For most, this will be achieved in the long-term tracking of their daily activities to discover the differences between a positive learning day and one that is not. The goal is to maximize the behaviours that make a day positive and minimize the influences that have a negative impact. Over the long term, the hope is that this will have a positive influence on their learning. With those limitations in mind, the research approach introduces a unique Learning Informatics Framework that shows support from experts in the field, engagement with potential users, and a solid comparison of existing learning frameworks.

Future Research

Building on the work from this research, three avenues for future research present themselves. First, to advance the study of using narrative assistance as a means to generate autobiographical stories for reflection and self-knowledge, as represented in the works of Sparkes, (2000), Findlay,(2008) and Zhao and Biesta, (2012). Second, to research learning identity by testing and trialling the Learning Informatics Framework, integrating research from Knights and Clarke (2013) and Falsafi, (2010). Finally, the area with the most promise for the long-term development of learning is to advance our understanding of learning identity self-development as a lifelong learner.

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Appendix A: Interview Question Themes

Question themes for Semi-Structured Interview:

The following questions are guidance for the semi structured interview with exemplars for the MRes research thesis: Personal Learning Informatics: Learning Agency through Self-Awareness. The interview will be approximately one hour and the participant will be re-briefed on the plan to record and use the transcripts for research.

The participants are all professionals and academics with relevant fields and the information is presented at that level. All participants can contact the researcher for more information or clarification if they desire.

Definitions and Goals:

1. For the purposes of this thesis, Personal Learning Informatics (PLI) is defined as the system of tools that will provide a framework to assist people in self-tracking, collecting key personal learning information to gain self-awareness and positively influence their learning behaviours.
2. Learning **agency** is the capacity of individuals to learn independently and to make their own free choices in relation to learning goals.
3. The overall goal of the research carried out as a result of this thesis is to explore the personal learning informatics as a means to describe a framework that can provide insight into the question “Can Personal Learning Informatics

identify and “*make visible*” the behaviour patterns that enable individuals to successfully adapt to learning challenges”.

4. Specifically, the objective of the thesis is to answer the question “What are the common core PLI key indicators that are associated with an individual's positive learning habits”.

Questions:

1. The research pursues the question “Can Personal Learning Informatics identify and “*make visible*” the behaviour patterns that enable individuals to successfully adapt to learning challenges”. Based on your experience do you feel that a learner can develop learning agency/autonomy through self-assessment outside the formal learning construct and apply that new self-awareness to modify their learning habits? (follow on: why or why not)
2. The PLI key indicators have been developed to through a synthesis of existing literature primarily from Self-Regulated Learning, Learning Autonomy, and Self-Management. What is your opinion of the provided PLI key indicators, based on your experience in relation to usefulness to achieve the goals of this thesis? (follow on: what is missing, what should be rejected or restructured?)
3. This question is free formed and open ended based on the responses from the previous two questions to allow the interviewee to fully express their views, provide insights and counsel based on their experiences and expertise.

Appendix B: Workshop exercises Eisenhower Chart

Important and Will answer	Important and Will not answer
Not important and Will answer	Not Important and Will not answer

Workshop Questionnaire

Q1: Was my day successful?

Q1a -What did I do to make my learning activity successful?

Q1b -What stopped me from have a successful learning activity?

Q1c - What behaviours do I want to try and do every day?

Q2: How did the external environment affect my day?

Q2a - What (people places or things) helped make my day successful?

Q2b - What (people places or things) made me feel unproductive?

Q3c - How do I do to create a positive environment?

Q4d - Who did I talk to that inspired me today?

Q3: Did I meet my Wellness goals?

Q3a - Did I meet my dietary goals and fitness goals?

Q3b - What can I do better to meet my dietary and fitness goals?

Q3c - Did I meet my rest goals?

Q4d - What can I do better to meet my rest goals?

Q4: Am I on the right track towards my academic goals?

Q4a - What are the challenges that I needed to overcome?

Q4b - What resources can I use to overcome these challenges?

Q4c - Did I review my self-regulated learning plan?

Q4d - How do I adapt my learning strategies to be more successful?

Q4e - Are my strategies for meeting my learning goals working?

Q4f - Am I being realistic in my learning assessment?

Q4g - Should someone help me make this assessment?

Q5: How did I feel?

Q5a - Did I start the day thinking I would be successful

Q5b - How did I handle today's challenges?

Q5c - How did I overcome today's challenges?

Q5d - Did I share or write about my successes and challenges today?

Q5e - What motivated me today?

Q5f - Do I need help finding ways to overcome my challenges?

Q5g - What would I talk to my mentor/peer/learning assistant about?

Workshop instructions

Session 1:

Part 1: Place the primary questions Q1 through Q5 into the decision matrix chart, spend as little time thinking about the question as possible. First impressions are what we are looking for in this exercise.

Part 2: discussion on individual reaction to questions and what could be reworded.

Session 2.

Part 1: Place the secondary question Q1a through Q5g into the decision matrix chart, spend as little time thinking about the question as possible. First impressions are what we are looking for in this exercise.

Part 2: discussion on individual reaction to questions and what could be reworded.

Session 3.

(5 or less)

Part 1: you have 10 mins to develop the most important question or sub question you believe that is missing.

Part 2: place all participant questions into the decision matrix chart

Final discussion